OPERATION MANUAL

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CE-26A
SIGNAL
GENERATOR

CUSHMAN
ELECTRONICS, INC.

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CE-26A
SIGNAL GENERATOR

OPERATION MANUAL

CUSHMAN
ELECTRONICS, INC.
830 Stewart Dr · Sunnyvale, CA 94086
Telephone: Area Code 408 – 739-6760

5601••0042

January 1974

WARRANTY

CUSHMAN ELECTRONICS, INC. WARRANTS EACH OF THE INSTRUMENTS OF THEIR MANUFACTURE TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF ORIGINAL PURCHASE. THE FOREGOING IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS, IMPLIED OR STATUTORY. THE COMPANY, UNDER THEIR LIBERAL WARRANTY, WILL REPAIR OR REPLACE ANY INSTRUMENT FOUND DEFECTIVE.

THIS WARRANTY MAY NOT APPLY TO INSTRUMENTS WHICH, IN THE OPINION OF THE COMPANY, HAVE BEEN ALTERED OR MISUSED.

This manual is intended to give the user a comprehensive knowledge of the instrument and its operation or repair. In the event of trouble, study the manual carefully. Most instrument malfunctions can be corrected by the user with a minimum of lost usage time.

For assistance or information of any kind, contact the factory. Give full details of the nature of your problem and include the model and serial number of the instrument.

Should it appear that the instrument needs to be returned to the factory for service or recalibration, let us know. Shipping instructions will be promptly given to you. There will be no charge for repair on instruments within the one year warranty other than transportation costs after 90 days of ownership. Estimates of charges for non-warranty or any other service will be supplied by the factory upon request before work is begun and such work will be done on an actual cost basis only.

CLAIM FOR DAMAGE IN SHIPMENT

Your instrument should be inspected and tested as soon as it is received. The instrument is insured for safe delivery. If the instrument is damaged in any way or fails to operate properly, file a claim with the carrier or, if insured separately, with the insurance company.

• • • • • •

We sincerely pledge our immediate and fullest cooperation to all users of our precision electronic instruments.

PLEASE ADVISE US IF WE CAN ASSIST YOU IN ANY MANNER

CUSHMAN ELECTRONICS, INC.
830 Stewart Dr. ☐ Sunnyvale, Cal. 94086 ☐ 408—739-6760

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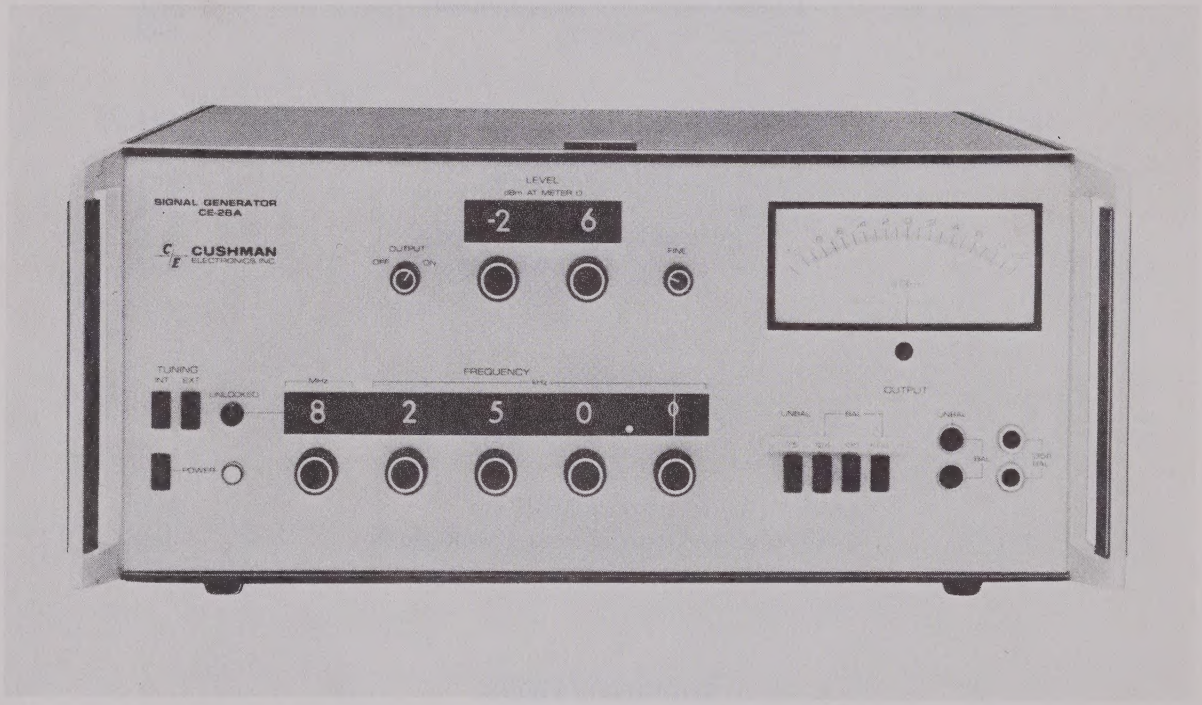

Figure 1-1. Model CE-26A Signal Generator

SECTION 1
GENERAL

DESCRIPTION

1.01 The Cushman Model CE-26A Signal Generator produces synthesized signals over the range of 4 kHz to 9.1 MHz. The range of output levels is from -70 dBm to +10 dBm.

1.02 The output impedances of 75Ω, 124Ω, 135Ω, or 600Ω are switch selectable. The 75Ω output is unbalanced only. 124Ω, 135Ω, and 600Ω are balanced only. A set of dual phone jacks is provided for 135Ω, while the other outputs are through coaxial jacks. 150Ω is available in place of 124Ω as option M-1.

1.03 Frequencies are selected with four digital dials and one continuously tuning dial. This dial tunes over a range of 1.1 kHz and has dial markings every 50 Hz.

1.04 The output frequencies of the CE-26A are generated by a synthesizer which provides a very stable frequency output. The output is automatically levelled to within 0.02 dB over the frequency range of the generator.

1.05 The CE-26A may be used by itself as an independent signal generator or it may be used with the CE-21A as a tracking generator. When used with the CE-21A in the tracking mode the output frequency is the same as the frequency to which the CE-21A is set.

1.06 The CE-26A may also be used with the CE-21A and the CE-23A (or CE-23) in the TTS system. In this setup the CE-26A may be used independently, or tracked with the CE-21A or both the CE-26A and the CE-21A may be swept over the same band by the CE-23A (or CE-23).

NOTE

The CE-26A may be used with either the CE-21A or the CE-21 Frequency Selective Levelmeter as a Tracking Signal Generator, or with either of the above and the CE-23A or CE-23 Spectrum Display in a TTS system.

1.07 Output levels are set with two digital dials. The level may be set in 1 dB steps over the range of +9 to -69 dBm. An additional Fine Level control is adjustable over a range of +1 to -1 dB as observed on the meter. In this way the full range of +10 to -70 dBm may be covered.

1.08 The output may be switched on or off, without turning off the instrument, by means of a front panel switch to facilitate "signal" "no-signal" measurements.

1.09 The complete specifications for the CE-26A are given in Table 1-1.

1.10 The following auxiliary items are furnished:

	Part No.
1-Adapter, BNC to Coaxial	2532-0001
1-Adapter, Coaxial to GR	2532-0002
2-Cables, coaxial, 12" BNC to BNC	7030-0061
1-Extender board (inside instrument)	7001-0029
1-Board extractor (inside instrument)	3875-0036
1-Operation Manual	5601-0042
1-Maintenance Manual	5601-0048

TABLE 1-1. Model CE-26A Specifications

FREQUENCY	
Range	4.0 kHz - 9.1 MHz
Digital Resolution	1 kHz
Continuous Fine Tuning Range	1.1 kHz
Fine Tuning Resolution	25 Hz
Stability	±300 Hz from 0°C to +50°C
Aging	±150 Hz per year
OUTPUT LEVEL	
Range	-70 to +10 dBm
Accuracy	
1 MHz, 0 dBm, 75Ω	
25°C ±5°C	±0.05 dB
25°C ±25°C, additional	±0.08 dB
124Ω, 135Ω, (150Ω option)	
referred to 75Ω	±0.1 dB
600Ω referred to 75Ω at 10 kHz	±0.2 dB
Frequency response referred	
to 1 MHz at 0 dBm, 75Ω	
4 kHz to 1 MHz	±0.25 dB
1 MHz to 9.1 MHz	±0.1 dB
124Ω, 135Ω, (150Ω option)	
referred to 75Ω	±0.05 dB
Frequency response referred to	
10 kHz, 0 dBm, 600Ω	
10 kHz to 350 kHz	±0.2 dB
4 kHz to 10 kHz and 350 kHz	
to 650 kHz, additional	±0.2 dB
Attenuator referred to 0 dBm	±0.1 dB
Resolution	
Meter linearity referred to 0 dBm	±0.02 dB
Meter range	±1.0 dB
Meter Resolution	±0.01 dB
Attenuator range	-69 to +9 dBm in 1 dB steps

TABLE 1-1. Model CE-26A Specifications (cont.)

OUTPUT IMPEDANCE	
Unbalanced	75Ω
Balanced	124, 135, 600Ω (150Ω-M1 option)
HARMONIC DISTORTION REFERRED TO FUNDAMENTAL	
Meter reading ≤0 dBm	<-40 dB
Meter reading >0 dBm	<-37 dB
INTERMODULATION DISTORTION REFERRED TO FUNDAMENTAL	<-50 dB
ENVIRONMENTAL	
Temperature	
Operating	0°C to +55°C
Storage	-40°C to +75°C
Humidity	95% RH, 40°C
Vibration	10-55 Hz, 0.01" (0.03 cm) peak to peak
Shock	4" (10.16 cm) bench drop
Altitude	
Operating	15,000 ft. (4.57 km)
Non-operating	25,000 ft. (7.62 km)
POWER REQUIREMENTS	115/230V ±10%, 50-400 Hz 50 watts
SIZE	
Height	7 1/4" (18.42 cm)
Width	17 1/4" (43.82 cm)
Depth	18 1/4" (46.36 cm)
WEIGHT	22 1/2 lb (10.21 kg)

SECTION 2
INSTALLATION

UNPACKING AND INSPECTION

2.01 When unpacking the CE-26A Signal Generator, inspect the packing box and the instrument for damage, and see if the auxiliary items listed in paragraph 1.10 are present. Verify satisfactory performance as outlined in the operating instructions (section 3) of this manual. If the instrument is damaged, fails to operate properly, or if any of the auxiliary items are missing, file a claim with the transportation agency, or, if insured separately, with the insurance company.

INSTALLATION PROCEDURES

2.02 POWER REQUIREMENTS

2.03 The CE-26A operates from a 115/230 volt (±10%) ac source (a screwdriver-actuated switch is provided on rear panel), 50 to 400 Hz. Power consumption is 50 watts. A one amp slo-blo fuse in the CE-26A provides protection (1/2 amp for 230V operation).

2.04 GROUNDING REQUIREMENTS

2.05 The CE-26A is equipped with a three-conductor power cable which, when plugged into an appropriate receptacle, grounds the instrument. To preserve this protection when operating the instrument from a two-wire outlet, use a three-prong to two-prong adapter, and connect the green lead on the adapter to ground.

2.06 CONVERSION TO RACK MOUNT

2.07 The CE-26A can be mounted in a standard 19-inch equipment rack. The hardware required for converting the CE-26A from cabinet to rack mount is not furnished with the CE-26A but may be purchased separately. If the instrument is to be converted for rack mounting, obtain the necessary kit from Cushman Electronics, and proceed as follows:

a. Remove the two screws in each handle.

b. Install the L-shaped brackets with the mounting lip forward; use the previously removed screws and attach to the handles.

c. Carefully slide the instrument into the equipment rack and secure with the screws provided.

PREPARATION FOR RESHIPMENT

2.08 It is recommended that the shipping box and foam packaging be kept in case it becomes necessary to return the instrument to the factory for service or repair. If further assistance is required, contact Cushman Electronics, Customer Service Department.

2.09 The following paragraphs contain a general guide for repackaging of the instrument for shipment.

NOTE

If the instrument is to be shipped to Cushman Electronics for service or repair, attach a tag to the instrument identifying the owner, and indicating the service or repair to be accomplished. Include the model serial number. In correspondence, identify

the instrument by model number and serial number.

2.10 If the original container is to be used, proceed as follows:

a. Place the instrument in the original container. (If the original container is not available, one can be purchased from Cushman Electronics.)

b. Ensure that the container is well sealed with strong tape or metal bands.

2.11 If the original container is not used, proceed as follows:

a. Wrap the instrument in plastic or heavy paper before placing in an inner container.

b. Place packing material around all sides of the instrument.

c. Place the instrument and inner container in a heavy carton or wood box, and seal with strong tape or metal bands.

d. Mark the shipping container with "DELICATE ELECTRONIC INSTRUMENT", "FRAGILE".

SERVICE OR REPAIR

2.12 In the event service or repair of the instrument is required contact:

Cushman Electronics, Inc.
Customer Service Department
830 Stewart Drive
Sunnyvale, California 94086
Telephone: (408) 739-6760

The southeastern service center is:

BCS Associates, Inc.
940 North Fern Avenue
Orlando, Florida 32803
Telephone: (305) 896-4881

SECTION 3
OPERATION

CONTROLS AND INDICATORS

3.01 The location of the front and rear panel controls and indicators is illustrated in Figures 3-1 and 3-2. The Controls, Indicators and Connectors are listed and briefly described in Table 3-1.

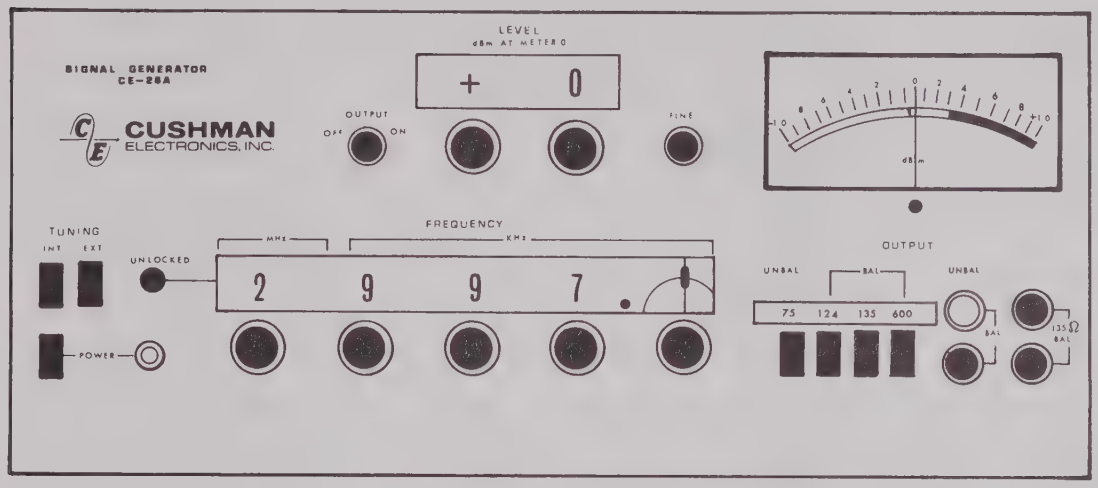

Figure 3-1. CE-26A Front Panel Controls and Connectors

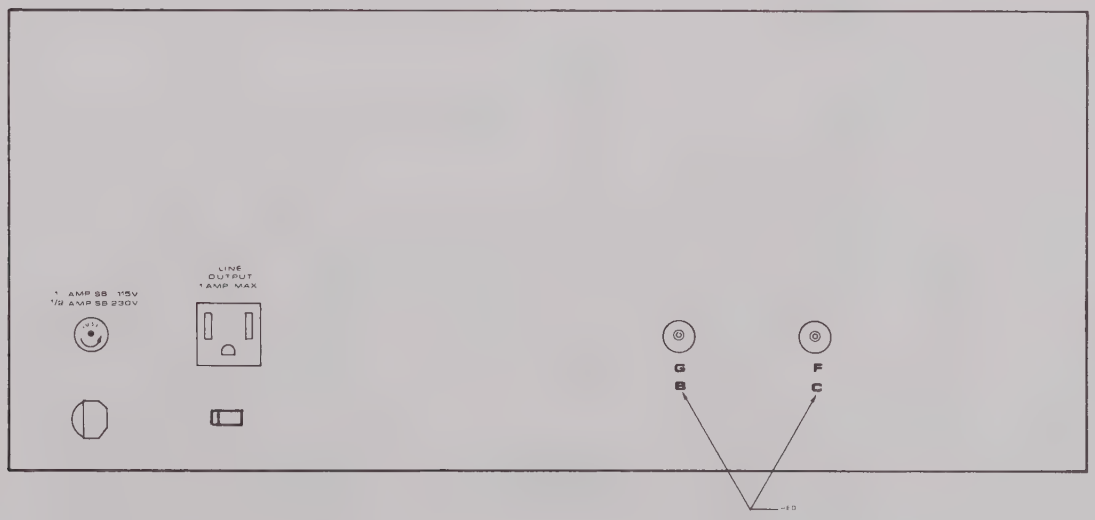

Figure 3-2. CE-26A Rear Panel Controls and Connectors

TABLE 3-1. CONTROLS, INDICATORS AND CONNECTORS

CONTROLS, INDICATORS & CONNECTORS	SCHEM. REF. NO.	DESCRIPTION	FUNCTION
		FRONT PANEL	
POWER	S1002 DS1002	Pushbutton Switch Indicator Light	Controls AC power to CE-26A Lighted when power is on
TUNING INT EXT	S1001	Two pushbutton mechanically interlocked switch	Selects internal or external frequency source
FREQUENCY MHz kHz	S1003, S1005 S1007, S1009 R1002	Rotary Switch Potentiometer	Selects first four digits of generated frequency Selects fifth digit (100 Hz) of generated frequency
UNLOCKED	DS1001	Indicator Light	Lights if synthesizer phase lock loop becomes unlocked
OUTPUT ON OFF	S1004	Rotary Switch	Turns off output without turning off power or affecting output impedance. Turns off level indicator lights.
LEVEL dBm AT METER 0	S1006, S1008 M1001	Rotary Switches Meter	Selects output power in 10 dB and 1 dB steps Indicates signal level between -1 & +1 dBm with 0.02 dB resolution
FINE	R1001	Potentiometer	Adjusts signal level over ±1 dB range
OUTPUT UNBAL 75Ω, BAL 124Ω, 135Ω, 600Ω	S1010	Four pushbutton mechanically interlocked switch	Selects source impedance
UNBAL, BAL	J1001, J1002	Coaxial Jacks	Top jack for unbalanced output Both jacks for balanced output
135Ω BAL	J1003-J1004	Dual Phone Jacks	For WE241 Balanced Line Connector. For 135Ω output only.
		REAR PANEL	
F (black) (red C)	J3004	BNC Connector	11.92 MHz LO input from CE-21A in EXT tuning mode
G (black) (red B)	J3003	BNC Connector	12-21 MHz LO input from CE-21A in EXT tuning mode
LINE OUTPUT 1 amp max	J3002	3-prong AC receptacle	Auxiliary 115/230V output
1 amp SB 115V 1/2 amp SB 230V	F3001	Fuse	AC Power overcurrent protection
	S3001	Switch	Sets AC input for either 115 or 230 volt AC power source

OPERATION

3.02 Check setting of 115/230V switch on rear panel to make certain it is set for the AC power source to be used.

a. Connect power cord to a 115/230V AC 50-400 Hz power source. If used with a CE-21A connect power cord to SWITCHED LINE OUTPUT receptacle on the rear panel of the CE-21A.

b. Turn the OUTPUT switch to OFF until ready to apply power to the load or circuit.

c. Depress the POWER switch. If connected to the CE-21A, the AC will be controlled by the PWR switch on the CE-21A. The POWER switch on the CE-26A must be on, however.

3.03 INTERNAL OPERATING MODE

3.04 Operation as an independently controlled signal generator.

a. Set the TUNING control to INT.

b. Set the FREQUENCY selector dials to the required frequency.

c. Set the LEVEL controls for the desired output level. Set FINE for 0 dB reading on the meter. (Set to +1 dB for maximum output, or -1 dB for minimum output settings.)

d. Select the required output impedance by depressing the proper switch.

e. Connect the load to the proper jack or jacks (upper coaxial jack for 75Ω UNBAL, dual coaxial jacks for 124Ω, 600Ω BAL or dual phone jacks for 135Ω BAL) for the required output impedance.

f. Turn OUTPUT switch to ON.

3.05 EXTERNAL OPERATING MODE

3.06 Operation as a tracking signal generator with the CE-21A.

a. Make the rear panel connections to the CE-21A with the coaxial cables provided. Connect red B to red B and red C to red C. If a CE-21 is used make the connections according to Figure 3-3.

NOTE

When using the CE-26A with either the CE-21A or the CE-21, make certain that the internal jumpers in the CE-21A, or the jumper in the CE-21, is removed according to the instructions on the rear panel.

b. Turn the OUTPUT switch to OFF until ready to connect the signal to the load or circuit.

c. Set the TUNING switch to EXT.

d. Set LEVEL and FINE controls for the required output level. Set FINE for 0 dB unless making a maximum or minimum setting.

e. Select the required output impedance by depressing the proper switch.

f. Connect the load or circuit to the proper jack for the required output impedance.

g. Turn OUTPUT switch to ON.

3.07 Operation with the CE-23A and CE-21A

a. Make rear panel connections between the CE-26A and the CE-23A from black F to black F and black G to black G. (If a CE-23 is used make the connections according to Figure 3-3.)

b. Follow the procedure given in paragraph 3.05 b-g.

c. Swept output is controlled by a switch on the CE-23A. (See the CE-23A, or CE-23, manual.)

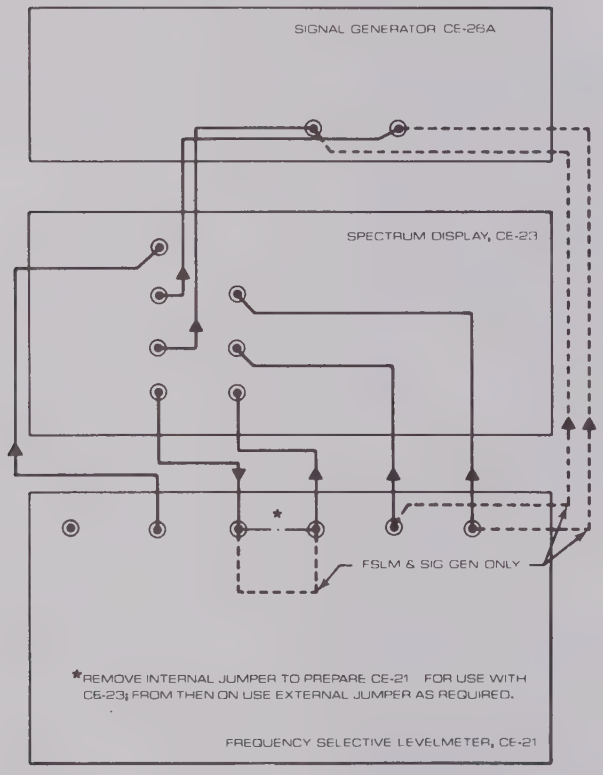
SIGNAL GENERATOR CE-26A
SPECTRUM DISPLAY, CE-23
FSLM & SIG GEN ONLY
*REMOVE INTERNAL JUMPER TO PREPARE CE-21 FOR USE WITH CE-23; FROM THEN ON USE EXTERNAL JUMPER AS REQUIRED.
FREQUENCY SELECTIVE LEVELMETER, CE-21

Figure 3-3. CE-26A, CE-23, CE-21 Rear Panel Interconnections

DEAR CUSTOMER:

Every effort has been made to ensure the accuracy of this manual. If an error is discovered please notify us on the postpaid cards attached.

Please indicate where the error has been made. To improve future manuals your comments are requested.

CUSHMAN ELECTRONICS
PUBLICATIONS DEPARTMENT

There is an error on page _____/figure _____ of the _____ manual; _____

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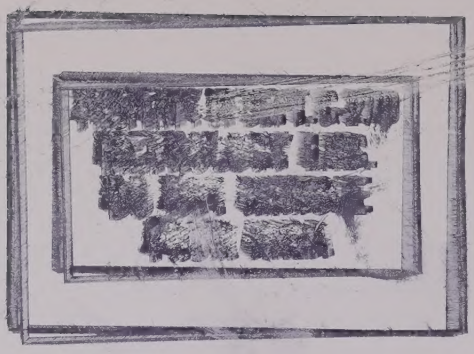

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